

Our Reference: RST-007-B

RECEIVED
CENTRAL FAX CENTER
PATENT
APR 07 2004IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Shoberg, Ralph S.
Serial Number: 09/825,416
Filing Date: April 3, 2001
Examiner/Art Group Unit: Eric B. Compton/3726
Title: METHOD AND APPARATUS FOR AUDITING A
TENSION LOAD IN THE THREADED FASTENER

OFFICIAL

COMMUNICATION

Mail Stop AF
Commissioner for Patents
PO Box 1450
Alexandria VA 22313-1450

Claims 1-17 cancelled without prejudice.

18. (Currently amended). A method for comparing relative clamp loads between
a plurality of previously installed threaded fasteners comprising:

providing a plurality of previously tightened threaded fasteners;

applying an additional torque in a tightening direction a first of the tightened
threaded fasteners until a break away torque is reached;

measuring the torque values applied to the first previously tightened fastener and
measuring the angle through which the first fastener rotates;

defining a first zero-angle point to be a point at which a tangent from a torque
versus angle plot, created from the measured torque and angle values from the first previously
tightened fastener, crosses an angle axis;

defining a first audit angle to be the angle between the first zero-angle point and
the angle associated break away torque for the first previously tightened threaded fastener;

applying an additional torque in a tightening direction a second of the previously

tightened threaded fasteners until a break away torque is reached;

measuring the torque values applied to the second previously tightened fastener and measuring the angle through which the second fastener rotates;

defining a second zero angle point to be a point at which a tangent from a torque versus angle plot, created from the measured torque and angle values from the second previously tightened fastener, crosses an angle axis;

defining a second audit angle to be the angle between the second zero angle point and the angle associated break away torque for the second previously tightened threaded fastener; and

comparing the first and second audit angles to determine relative clamp loads.

19. (Previously presented). A method as in claim 18 wherein the torque is applied until an angle of rotation between 1 and 15 degrees is achieved.

20. (Previously presented). A method as in claim 18 wherein audit angles are defined for the remainder of the plurality of tightened threaded fasteners and the plurality of audit angles are compared.

21. (Previously presented). A method as in claim 18 wherein the first and second audit angles are compared to a predetermined audit angle.

22. (New). A method for comparing relative clamp loads between a plurality of previously installed threaded fasteners comprising:

providing a plurality of previously tightened threaded releasing fasteners;

applying an additional torque in a releasing direction a first of the previously tightened threaded fasteners until a break away torque is reached;

measuring the torque values applied to the first previously tightened fastener and
measuring the angle through which the first fastener rotates;

defining a first zero-angle point to be a point at which a tangent from a torque
versus angle plot, created from the measured torque and angle values from the first previously
tightened fastener, crosses an angle axis;

defining a first audit angle to be the angle between the first zero-angle point and
the angle associated break away torque for the first previously tightened threaded fastener;

applying a torque in a releasing direction a second of the previously tightened
threaded fasteners until a break away torque is reached;

measuring the torque values applied to the second previously tightened fastener
and measuring the angle through which the second fastener rotates;

defining a second zero angle point to be a point at which a tangent from a torque
versus angle plot, created from the measured torque and angle values from the second previously
tightened fastener, crosses an angle axis;

defining a second audit angle to be the angle between the second zero angle point
and the angle associated break away torque for the second previously tightened threaded fastener;
and

comparing the first and second audit angles to determine relative clamp loads.

23. (New). A method as in claim 18 wherein the torque is applied until an angle
of rotation between 1 and 15 degrees is achieved.

24. (New). A method as in claim 18 wherein audit angles are defined for the
remainder of the plurality of previously tightened threaded fasteners and the plurality of audit

angles are compared.

25. (New). A method as in claim 18 wherein the first and second audit angles are compared to a predetermined audit angle.